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CHEMICAL & ENGINEERING

NEWS

More scientific news from ACS Miami Beach meeting

Solid Ion Conductors

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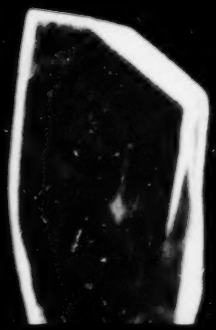

CHEMICAL & ENGINEERING
NEWS

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MAY 20, 1985

News of the Week

■ **Allied Corp. and Signal Cos. merge to form company with annual sales of almost $17 billion.** **Page 4**

■ **U.S. production of aerosol units rose 5% in 1984.** **Page 5**

■ **Phillips Petroleum is licensing new yeast recombinant DNA expression system.** **Page 5**

■ **BASF America will buy automotive paints and ink producer Inmont for $1 billion.** **Page 5**

■ **Judge rules U.S. government not liable to contribute to industry settlement with Vietnam veterans in agent orange suit.** **Page 6**

Cover: Crystal of β''-alumina in which sodium content has been replaced by europium(II) glows yellow-green when illuminated by ultraviolet light. When the sodium is replaced by terbium(III), the crystal glows blue; when replaced by europium(III) reddish purple

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Business

Dionex hopes to keep a step ahead of the big boys by improving its lead in the ion chromatography market; U.S. polymer production climbed to its highest point ever in 1984. **Page 9**

International Business

Chemical business executives in Canada see a rosy future, survey finds—employment, sales, and profits all on the rise. **Page 14**

Government

Federal agencies announce plans of action for the coming year, including proposed regulations. **Page 18**

Science

From the ACS meeting: studies of gas-phase ions proving richly rewarding; inflammation changes lung cell metabolism; society promoting joint catalysis programs with U.S.S.R. and China. **Page 21**

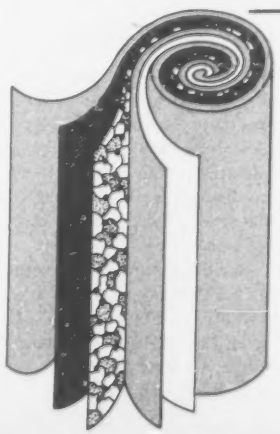
Symposium on polymers, honoring Herman Mark on his 90th birthday, drew four Nobel Laureates among the dignitaries. **Page 32**

Technology

From Miami Beach: computer models help track hazards of fires; mechanisms given for different LC-MS methods; criminalist charges that forensic laboratories are unreliable. **Page 35**

ACS News

ACS Council tightens eligibility requirements for members with emeritus and retired status, raises dues. **Page 61**



Special Report

Solid ionic conductors are unusual materials that researchers see uses for in high-energy-density batteries, lasers, and phosphors. **Page 42**

Polymer output reached new high in 1984

David Webber, C&EN New York

Coming off a good year in 1983, aggregate polymer production rose to its highest point ever in 1984. At just under 50 billion lb, the composite total for output of plastics, synthetic fibers, and synthetic rubber surpassed the previous record of 47.6 billion lb reached in 1979. By erasing the downturns of the early 1980s, the surge lifted the composite compound growth rate for all major polymers to an annual average 3.5% for the past 10 years.

Still, the totals mask the shortfall of last year's synthetic fibers output of 9.4 billion lb not only from the record set in 1979, but from output reported for 1978, 1980, and 1981 as well. And 1984 production of synthetic rubber, though growing more than that for either of the other two polymer groups, remained well below levels of a decade earlier. Only plastics production, at 35.6 billion lb last year, topped its previous record of 33.1 billion lb in 1983.

At about 8% (all plastics statistics based on data from the Society of the Plastics Industry), last year's increase in plastics output fell short of the 15% jump registered in 1983 over recession year 1982. However, it was a respectable rise for the second leg of the business cycle's upward swing. The thermoplastic resins segment, which accounted for about 84% of plastics production in 1984, grew 8% from 1983, paced by output of polyvinyl chloride (and its copolymers) and polypropylene (and its copolymers), both of which climbed 11%.

PVC production was especially spurred by a 28% jump in demand for PVC pipe and tubing, a segment that alone accounted for 43% of PVC consumption last year. For polypropylene producers, the pace was set by consumption increases of 10% for the fibers and filaments segment (27% of the market) and substantial growth in the smaller transportation, appliance, and sheet areas.

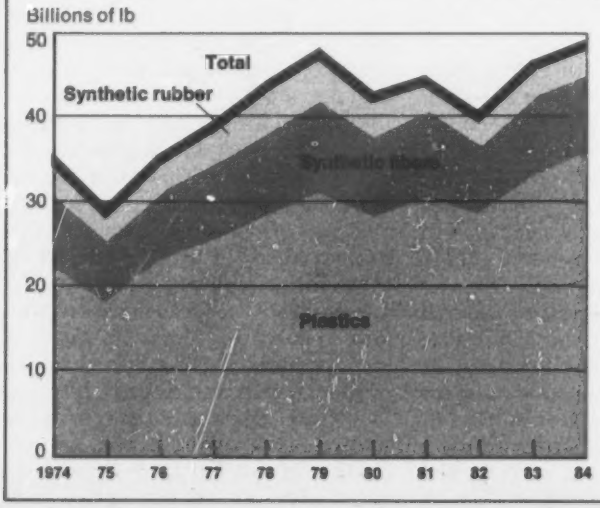
More-moderate increases in production were registered by polystyrene—aided by a 34% jump in exports and good demand growth from markets in disposables, expandable beads, and furniture and furnishings—and high-density polyethylene, whose sales and use in the important blow-molding area (35% of the market) increased 14% to 2.08 billion lb. On the other hand, HDPE's other substantial application, injection molding, grew less than 1% between 1983 and 1984.

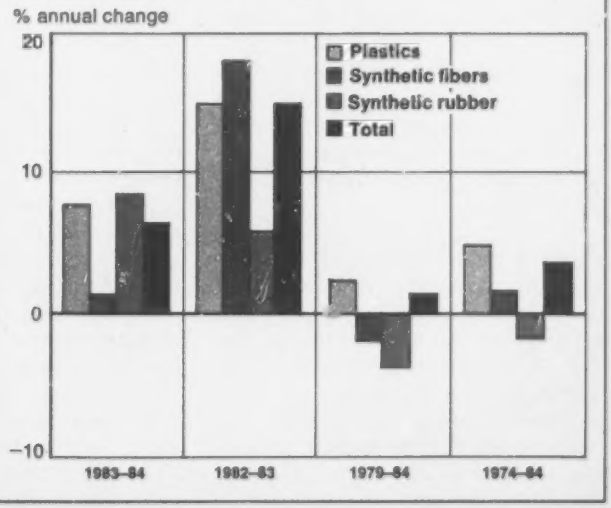
Output of low-density polyethylene was held to a 5% rise because consumption for film (58% of the market) was nearly level with the year before. LDPE's performance was mixed. On the one hand, consumption of LDPE in injection molding declined nearly 7% to 612 million lb. Conversely, its use in extrusion coating, the other sizable application, increased 12% to 640 million lb in 1984.

The 6% rise in thermoset production last year was paced by epoxy resins, which benefited from a 17% jump in use in protective coatings (40% of the market); by polyester resins, with strong consumption gains in almost all applications; and by melamine resins, a small component. Output of the largest thermoset, phenolic resin, grew minimally, held down by flat demand from the plywood industry (52% of the market) and a sharp drop in use in insulation (14% of the market).

Output of plastic resins undoubtedly would have been higher had it not been for a widespread decline in export volume, a result of the powerful dollar. Exports of high-density polyethylene, for example, fell to 696 million lb in 1984 from 1 billion lb the year before, a decline of some 30%. Similarly, exports of PVC dropped to 379 million lb, a one-year slide of some 29%. Other losers included polypropylene, exports of which dipped 2% to 782 million lb, and unsaturated polyes-

Plastics, rubber contributed most to 6% polymers output growth last year





Total polymers production approached 50 billion lb last year

	Billions of lb		Common units					Average annual growth			
	1984	1983	1984	1983	1982	1979	1974	1983–84	1982–83	1979–84	1974–84
PLASTICS (millions of lb)											
Thermosetting resins	**5.55**	**5.25**	**5,549**	**5,254**	**4,367**	**4,856**	**3,514**	**5.6%**	**20.3%**	**2.7%**	**4.7%**
Phenol and other tar acid resins	2.50	2.48	2,502	2,484	2,060	1,781	1,355	0.7	20.6	7.0	6.3
Urea resins	1.20	1.17	1,199	1,172	998	1,367	835	2.3	17.4	−2.6	3.7
Polyesters (unsaturated)	1.23	1.08	1,232	1,084	865	1,147	911	13.7	25.3	1.4	3.1
Epoxies (unmodified)	0.41	0.33	406	334	286	361	249	21.6	16.8	2.4	5.0
Melamine resins	0.21	0.18	210	180	158	200	164	16.7	13.9	1.0	2.5
Thermoplastic resins	**30.04**	**27.80**	**30,036**	**27,799**	**24,425**	**26,768**	**19,273**	**8.0%**	**13.8%**	**2.3%**	**4.5%**
Low-density polyethylene	8.41	8.04	8,413	8,041	7,503	7,793	5,973	4.6	7.2	1.5	3.5
PVC and copolymers	6.76	6.07	6,760	6,066	5,326	6,119	4,850	11.4	13.9	2.0	3.4
High-density polyethylene	6.09	5.69	6,085	5,691	4,928	5,010	2,837	6.9	15.5	4.0	7.9
Polystyrene[a]	3.84	3.57	3,838	3,567	3,191	4,005	3,364	7.6	11.8	−0.8	1.3
Polypropylene, copolymers	4.94	4.43	4,940	4,434	3,477	3,841	2,249	11.4	27.5	5.2	8.2
TOTAL[b]	**35.59**	**33.05**	**35,585**	**33,053**	**28,792**	**31,624**	**22,787**	**7.7%**	**14.8%**	**2.4%**	**4.6%**
SYNTHETIC FIBERS (millions of lb)											
Cellulosics	**0.59**	**0.60**	**587**	**603**	**551**	**930**	**1,199**	**−2.7%**	**9.4%**	**−8.8%**	**−6.9%**
Rayon	0.39	0.38	389	375	355	606	817	3.7	5.6	−8.5	−7.2
Acetate[c]	0.20	0.23	198	228	196	324	382	−13.2	16.3	−9.4	−6.4
Noncellulosics	**8.82**	**8.71**	**8,823**	**8,705**	**7,341**	**9,433**	**6,908**	**1.4%**	**18.6%**	**−1.3%**	**2.5%**
Polyester	3.39	3.54	3,392	3,543	3,168	4,178	2,934	−4.3	11.8	−4.1	1.5
Nylon[d]	2.41	2.42	2,412	2,418	1,927	2,721	2,126	−0.2	25.5	−2.4	1.3
Glass fiber[e]	1.35	1.17	1,351	1,167	899	1,014	683	15.8	29.8	5.9	7.1
Olefin	1.00	0.91	997	906	723	759	531	10.0	25.3	5.6	6.5
Acrylic[f]	0.67	0.67	671	671	624	761	634	0.0	7.5	−2.5	0.6
TOTAL[b]	**9.41**	**9.31**	**9,410**	**9,308**	**7,892**	**10,363**	**8,107**	**1.1%**	**17.9%**	**−1.9%**	**1.5%**
SYNTHETIC RUBBER (thousands of metric tons)											
Styrene-butadiene[g]	2.11	1.99	958	904	876	1,378	1,466	6.0	3.2	−7.0	−4.2
Polybutadiene	0.79	0.73	359	333	288	397	310	7.8	15.6	−2.0	1.5
Ethylene-propylene	0.47	0.39	215	175	123	175	126	22.9	42.3	4.2	5.5
Neoprene	0.29	0.25	130	115	119	183	163	13.0	−3.4	−6.6	−2.2
Nitrile	0.15	0.12	67	55	45	75	88	21.8	22.2	−2.2	−2.7
Other[h]	0.81	0.78	366	353	378	319	346	3.7	−6.6	2.8	0.6
TOTAL[b]	**4.62**	**4.27**	**2,095**	**1,935**	**1,829**	**2,527**	**2,499**	**8.3%**	**5.8%**	**−3.7%**	**−1.7%**

a No longer includes acrylonitrile-butadiene-styrene or styrene-acrylonitrile resins; previous years' figures are restated. b Totals are for those products listed. Totals may not add because of rounding. c Includes diacetate and triacetate yarn; does not include cigarette filters. d Includes aramid. e Total for 1984 estimated from nine months' data. f Includes modacrylic. g Excludes high-styrene latex. h Includes butyl, polyisoprene, chlorosulfonated polyethylene, polyisobutylene, and acrylo, fluoro, polysulfide, and silicone elastomers.
Sources: Society for the Plastics Industry, Textile Economics Bureau, Rubber Manufacturers Association

ter resins, exports of which fell 18% to 8 million lb in 1984.

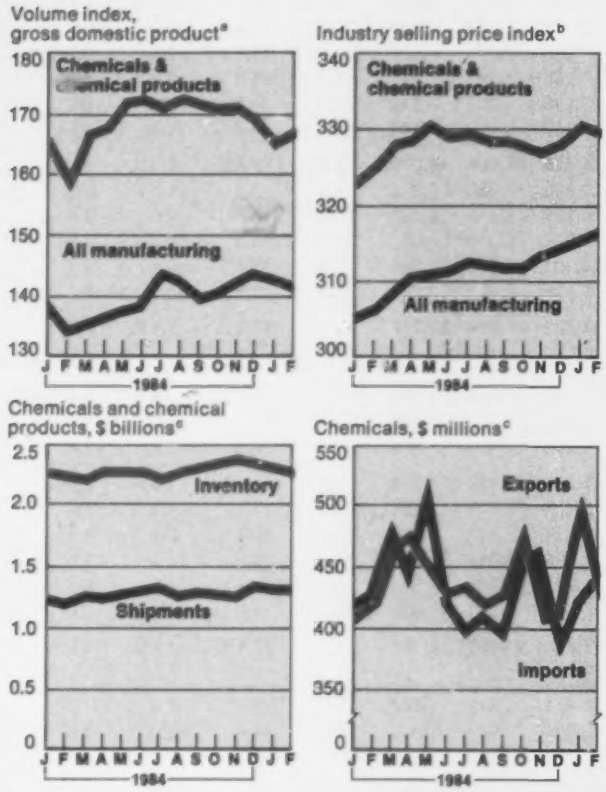
Exports did not decrease in all cases, however. Shipments overseas of low-density polyethylene, for instance, increased 6% from 1983 to 974 million lb. Among smaller-volume products, exports of phenolic resins swelled 36% to 22 million lb last year, and exports of epoxy resins jumped 18% to 41 million lb.

Producers of synthetic fibers spent 1984 trimming production runs in response to the swelling rise of cheaper imports. Having climbed an average of 19% per year since 1981, textile and apparel imports jumped another 32% last year—spurred largely by the continued strength of the dollar against other currencies—and were the chief cause for declines in output of the two biggest fiber segments, polyester and nylon, down 4% and less than 1%, respectively (statistics from the Textile Economics Bureau). With the help of strong gains by glass and olefin fibers (25% of all fibers output), the noncellulosics area managed a 1% rise in production last year. Cellulosics output, which has been shrinking overall during the past 10 years, diminished in 1984 after rebounding strongly the year before.

Synthetic rubber followed its 1983 rebound from the recession with another increase in 1984, raising production another 8%. The largest segment, styrene-butadiene rubber (46% of all synthetic rubber output last year), increased production a solid 6% last year. That was not enough, however, to overcome the product's long-term decline. Over the past 10 years, SBR production has fallen at an annual compound rate of about 4%.

The best performers in the rubber segment last year, in terms of production, were ethylene-propylene rubber—output up 23%—and nitrile rubber—output up 22%. □

Canadian Chemical Execs Are Optimistic



a Seasonally adjusted, 1971 = 100. b 1971 = 100. c Canadian dollars.
Source: Statistics Canada

Chemical output has some weak spots

Production, thousands of metric tons	1984	First two months 1985	First two months 1984	% change 1985-84
ORGANICS				
Ethylene	1464	291	214	36.0%
Propylene	665	104	109	−4.6
Benzene	557	86	103	−16.5
Toluene	430	69	69	0
Xylene	417	70	74	−5.4
PLASTICS				
Polyethylene, low density	529	109	78	39.7
Polyethylene, high density	227	39	27	44.4
Polyvinyl chloride	252	45	41	9.8
INORGANICS				
Hydrochloric acid	161	27	25	8.0
Nitric acid	1100	183	183	0
Phosphoric acid[a]	891	120	136	−11.8
Sulfuric acid	4053	664	771	−13.9
Ammonia, anhydrous	3493	579	584	0.9
Ammonium phosphate	1383	242	251	−3.6
Chlorine	1424	239	223	7.2
Sodium hydroxide	1575	261	245	6.5

a 100% P_2O_5. Source: Statistics Canada

Canadian business executives now are more confident about the near-term economic outlook for Canada, according to a recent survey conducted by the Conference Board of Canada. The majority of the executives surveyed see lower unemployment, stronger sales, and improved profits lying ahead, at least for the next six months.

Compared to the results of a similar survey conducted late last year, fewer executives say that their investment plans are affected adversely by high interest rates and labor costs. Fewer, too, view weak market demand as a major deterrent to more investment.

The results of this latest Conference Board survey reflect well the attitude within the Canadian chemical industry. "Optimistic" is the word most chemical industry leaders are using to describe how they feel about the foreseeable future. This despite the fact that there are, indeed, weak spots in the market. And, during the first quarter, some Canadian chemical companies didn't fare so well on the bottom line as they did in the first quarter of 1984.

Early production results are a mixed bag. During the first two months of the year, ethylene and some of its major derivatives scored impressive advances. This, of course, is because Alberta Gas Ethylene's second ethylene plant—a 680,000 metric-ton-per-year unit—went on stream late last year and several large derivatives units followed it into operation.

Elsewhere, the record is not so rosy. Aromatics output was down during the first two months. Several major inorganics, particularly those related to fertilizer, took a nosedive.

Despite these scattered early setbacks, Canadian chemical executives, particularly those in the petrochemical sector, have good reason to be optimistic. That good reason is the so-called "Western Accord"—the energy agreement signed in late March between the federal government and three western energy-producing provinces.

The accord will steer the chemical industry's basic feedstocks toward more "market responsive" pricing, something that a petrochemical industry task force recommended more than a year ago. It eliminates many of the onerous up-front taxes and special charges, contained in the old National Energy Plan (NEP), that raised havoc with company profits for so long.

W. Norman Kissick, chairman of Union Carbide Canada, says that he is "cautiously optimistic" about the effects of the Western Accord on oil and gas pricing. His firm, hurt more than most by NEP pricing policies, has been a leader in the campaign to get relief from taxes on feedstock. He wonders, however, if some of the front-end charges that are scheduled to disappear on June 1 may reappear in some other form.

Earl Anderson, New York